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EROSION CONTROL PRACTICES DIVISION

Heavy Rains - Erosion and Crop Difficulties - A. E. Lowe, Garden City, Kansas.-"The wet weather of May continued on through June and made it very difficult to plant sorghums and to secure good stands.

"The total rainfall for June was 9.72 inches which is the most received in any one month since weather records were started at this station in 1908. The previous high was 9.03 inches in June of 1928. The 43 year average rainfall for June is 2.96 inches. May had been the record high for any May and with June a record high for all months, it brought the total for the calendar year to the end of June to a record high. The total for the first six months of 1951 was 21.03 and the previous high for the period was 19.34 made in 1928. This 21.03 for the first six months is more than the 43 year average annual rainfall which is 18.08 inches.

"This heavy precipitation was accompanied by cool temperatures. The average maximum temperature for June was 78.1°F, which is 8.5° below the 36 year average of 86.6. The average minimum temperature for June was 55.0°F which is 4.8° below the 36 year average.

"This combination of excessive precipitation and cool temperatures accounts for the poor stands secured on most of the sorghums that were planted during June. It also accounts for the large amount of bacterial glume blotch appearing on the wheat. It is so bad this year it occurs on the leaves and stems as well as the glumes of the wheat.

"Soil erosion has been unusually severe because of the rains. The water erosion was unusually severe because of the heavy rains and the beating of the heavy rains and hail smoothed the fields so they blew badly many times between rains while the fields were still too wet to work. This caused the loss of some sorghum stands and the thinning of some others.

"The wheat improved during the month but will be late and weedy. Fortunately very little rust developed in spite of the heavy rains."

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** All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

Ridged Corn Versus Flat Corn - C. S. Britt, Beltsville, Md.-"Six plots of corn were planted on imperfectly drained Christiana silt loam on May 29, only four days before the heavy rains began. In three plots, the corn was planted on ridged rows, while in the other three, the corn was planted on flat rows. The flat plots stayed wet during the first half of June and less than 1% of the corn germinated under these water-logged conditions. The ridged rows drained the water off to a waterway and germination of corn was excellent on the ridges.

"The results we obtained probably explains why much flat-planted corn in Southern Maryland failed to produce good stands this year. Germination was so poor on many fields that they were disked and replanted."

Ladino Clover and Bromegrass Mixture Produced Exceptional Beef Gains - D. D. Smith, Columbia, Missouri.-"Mr. Whitt reports that ladino clover with bromegrass produced exceptional beef gains this spring. Grazing began April 30, and by June 20, 233 pounds of beef gain was recorded per acre. The plot has carried two head per acre all spring. Kentucky Bluegrass and Bromegrass, each receiving nitrogen, had produced 167 and 161 pounds per acre, respectively, by June 20."

The Effect of Stubble Mulching on Nitrification Rate of the Soil - F. L. Duley, Lincoln, Nebraska.-"Mr. M. F. Hollingshead has just completed a thesis in microbiology, in which he studied the effect of stubble mulching on the nitrification rate of the soil. One of the points he determined was the effect of season on the nitrification rate of subtilled and plowed land. Soils sampled in the fall showed a greater gain in nitrification rate in eight weeks on subtilled than on plowed land. Samples taken in the spring showed the reverse trend. The following table illustrates this point.

Sampling date		Gain in p.p.m. of NO_3-N in 8 weeks	
		Plowed	Subtilled
Sept. 25, 1950		5.4	10.5
Nov. 28, 1950		3.2	5.0
	Fall mean	4.3	7.8
March 8, 1951		7.6	4.8
March 20, 1951		3.4	1.6
	Spring mean	5.5	3.2

Contour Listing of Corn Favored in Western Iowa - F. W. Schaller, Ames, Iowa.-"Contour listing of corn on most soils in western Iowa generally gives higher yields, saves soil and requires less work than other methods.

"Hard-ground listing works well on stubble land, but loose-ground listing is best on heavy sods. On sloping land lister furrows must be on the contour to obtain good stands of corn and to give most erosion control.

"Listing gives good results on much of the corn land in the Missouri River bottom. Corn planting can be done quickly, the soil isn't overworked and weeds can be controlled more effectively and easily. Choosing the tillage method for preparing a seedbed for corn is only one step in a program of good soil management. Other factors are fertilizer, proper rotations, drainage and special practices."

The Effect of a "Poor Land" Perennial Legume on the Following Wheat Yield.-"In early June, three test fields on the Station turned in good to excellent yields of certified Chancellor wheat.

"One field of 7.4 acres produced 27 bu./ac.; another of 16.2 acres yielded 29 bu./ac. and the third of 35.7 acres averaged 42 bu./ac.

"In the first 2 fields the cropping plan consisted of a simple 2-year rotation of wheat-sown Kobe lespedeza, followed by either cotton or corn. In the largest high-producing field, the wheat followed 7 continuous years of perennial sericea lespedeza which had been regularly harvested primarily for seed.

"Sericea was sown on this Class II and Class III land, originally badly depleted cropland, in order to protect and build up the land. The final seed crop was harvested in the fall of 1950 and the woody stem residue windrowed and burned off with but trivial loss of leaf-litter ground cover. The sericea stubble and ground litter was then turned under, 400 pounds per acre of 4-8-6 fertilizer distributed, and the field was sown to wheat. The seedlings withstood the severe winter of 1950-51, and produced a perfect stand. Only 15 pounds of nitrogen topdressing was applied in the spring." (B. H. Hendrickson, Watkinsville, Ga.).

Forage Meter - Joel E. Fletcher, Tucson, Arizona.-"Investigations were continued into the use of the dielectric forage meter under range pasture conditions. Nearly pure stands of forage plants ranging from Kentucky blue grass through sedges, rushes and giant Delphinium to quaking aspen were tested. It appears that one calibration is all that is necessary for a determination of the pounds of forage per acre on a dry weight basis. Forage yields tested ranged from 30 pounds per acre to 1000 pounds. It appears that the average precision one might expect is about 4 pounds per acre per 100 pounds of dry forage, although in the case of one sample of rush, this extended to a difference of 20 pounds. It is not known in this case, however, whether the meter or the clopping was in error.

"The meter can find wide application in pasture and range studies, where its speed and portability make it particularly useful. When applied to small plots it is the only means yet developed which can be used at all, since clipping would destroy such a plot."

Crop Residues Reduced Soil Losses - C. A. Van Doren, Urbana, Illinois.-"L. E. Gard reports that soil losses from Grantsburg silt loam on 5 and 9% slopes on the station have been materially reduced by proper utilization of residues. Soil losses from corn plots have been about 1/5 as much since 1947 as they were before that season.

"Prior to 1947 the set of runoff plots were farmed to a three-year rotation of corn, winter wheat (les.), lespedeza; winter wheat was harvested as a forage crop in the spring; lespedeza was harvested by grazing; corn stalks were cut and removed simulating silage production. Since 1947 corn stalks have been disced into the ground in preparing seedbed for wheat; winter wheat has been harvested for grain, and lespedeza has been harvested as hay.

"Soil losses are presented below as pounds of soil loss per inch of rainfall; grain production of corn and winter wheat on these plots during the periods when residues were handled as previously explained.

Erosion Per Inch of Rain

	5% Slopes		9% Slopes	
	Residues Removed Lbs.	Residues Returned Lbs.	Residues Removed Lbs.	Residues Returned Lbs.
Corn	440	114	1042	210
Winter wheat	843	203	880	366

Conservation Effects of Crop Rotation on a Sandy Soil in Vegetable Production - O. R. Neal, New Brunswick, N. J.-"Conservation effects of crop rotation on a sandy soil in vegetable production is the title of a manuscript soon to be published. This report concerns the results from our principal crop rotation-runoff study at Marlboro. The summary is as follows:

"Little or no livestock is kept on many vegetable and truck farms of the Coastal Plain in New Jersey and surrounding areas. In the absence of need for pasture and hay crops, the rotation of cultivated crops with grass-legume mixtures is not commonly practiced. Many soil areas have been cultivated continuously and intensively during recent years. Under this management numerous cases of deterioration of soil physical conditions increased runoff and erosion, and decreased crop yield have resulted.

"Maintenance of favorable physical conditions of the soil appears essential for effective water and soil conservation. Regular rotation of cultivated crops with sod mixtures is a practical and effective method for maintaining desirable physical properties of the soil.

"Average soil and water losses have been much lower from cultivated areas rotated with clover-grass sod than from continuously cultivated areas. During growing seasons while cultivation operations were identical on all areas, soil and water losses were 55 and 62 percent lower, respectively, from the most effective rotation as compared with continuous cultivation.

"Crop yields were improved under these conservation cropping systems. The largest yield increases came from the cropping systems that were most effective in conserving soil and water.

"Intensive cover cropping practices were effective in reducing soil and water losses and in increasing soil productivity.

"Crop rotation, as practiced in this study, reduces the intensity of cultivation and provides regular additions of organic matter to the soil in substantial amounts. It is suggested that some measure of crop rotation is an essential part of an effective conservation program in this Coastal Plain area."

The Effect of Fall Chiseling on Runoff and Soil Moisture - F. H. Siddoway, St. Anthony, Idaho.-"One of the 10 acre stubble strips on the new farm was sub-tilled using two different methods. Deep tillage (about 20"-22") was accomplished by the use of the Noble chisel with a spacing between chisel furrows of about 6 feet. This implement ruptures the surface quite thoroughly and leaves an opening to chisel depth through the winter that does not seal over. Shallow tillage was done with the Jeoffry chisel to a depth of about 8 to 10 inches with a spacing between chisel furrows of 18 inches. While this type of chiseling leaves an opening to chisel depth, probably the greater part of the beneficial effect is gained due to the rough condition the soil is left in over winter. An area through the middle of the strip was not tilled so differences could be measured and compared.

"The results of the fall tillage are presented in the following table.

Depth	Shallow tillage	Deep tillage	Not tilled
	Inches Moisture	Inches Moisture	Inches Moisture
0'-1'	3.16	3.53	3.27
1'-2'	2.70	3.02	2.62
2'-3'	2.20	2.75	1.57
3'-4'	2.41	2.32	1.40
4'-5'	2.09	2.28	1.78
5'-6'	1.99	2.32	2.00
Total	14.55	16.32	12.64

"As in other samplings this spring, land that was fall tilled with a chisel type implement retained much more ot the spring runoff than land not tilled. This field varied in slope from 0 - 6% and was sampled accordingly. One of the samples was taken in a swale and was drifted over with snow last winter. The upper part of the swale was fall tilled shallow, the middle left untilled and the lower portion deep tilled. The total moisture for the 6-foot depth of each treatment was 18.50 inches, 12.31 inches, and 21.98 inches respectively."

Stubble Mulch Studies - C. J. Whitfield, Amarillo, Texas.-"At the end of June, wheat growing on the subtilled fallow plots was nearly ripe, while that on the onewayed fallow plots was less advanced in maturity. Clippings made on June 22 indicated that the stubble mulched wheat will make a good showing relative to the onewayed, having an average of 114 percent greater weight of heads per acre on the wheat-on-fallow plots. Hail, which occurred on the night of June 14, did an estimated 30 - 40 percent damage to the plots. Due to their being ripest, the stubble mulched plots suffered the greatest injury. Considerable weed growth has developed in the continuous wheat plots, which promises to create a problem in combining, if spraying is not done to control it. As will be noted in the table following, yields of onewayed wheat will be very poor, the weight of the heads amounting to less than 600 pounds per acre on June 22.

"It will be noted that the subtilled wheat-on-fallow plots had about a third greater weight of heads per acre than the subtilled continuous wheat plots, despite the fact that there was very little difference in the treatment of the plots since the 1949 harvest. The 1950 crop died early in the spring due to drouth and greenbug damage, and for all practical purposes the continuous wheat plots can be considered as having been in fallow during the spring and summer of 1950. The plots being farmed on a fallow system, however, due to the greater amount of residue, produced on them by the 1949 crop, were in a better position to store moisture during the summer of 1950 and had a better reserve of moisture at planting time in the fall of 1950. This undoubtedly accounts for the better condition of the wheat-on-fallow plots compared to the continuous wheat plots.

Table 1.--Condition of wheat on stubble mulch plots on June 22, 1951, and the amount of available moisture on the plots on October 12, 1950.

TILLAGE	Lbs. Dry Weight per Acre		Available moisture on October 12, 1950 - Inches per 4 feet of soil
	Entire plant	Heads	
		Continuous Wheat	
Subtilled	1,981	901	5.06
Onewayed	1,289	592	3.32
		Wheat-on-Fallow	
Subtilled	2,630	1,184	5.25
Delayed subtilled	2,490	1,232	6.37
Onewayed	1,278	564	3.33

"It has been noted that nitrate-nitrogen is consistently lower on the subtilled than on the onewayed plots. The reason for the depressed nitrification, however, has not been clear. This condition might be due to the fact that plant residues decay on the surface of the soil where temperature and moisture conditions are less favorable for nitrification than at a greater depth within the plow layers. It may also be true that a modified decay process of plant residues takes place resulting in more stable by-products being produced which are slow to release nitrates. It may also be true that stubble mulching through insufficient aeration may cause a slower release of nitrates from the inert ligno-proteinates comprising the bulk of the soil organic matter. To explore the problem further, samples of soil from the 0-3 inch zone were taken from the onewayed and subtilled wheat-on-fallow plots on May 23 immediately after being leached by heavy rains. The soils were incubated at a room temperature of 230 C and at 18 percent moisture for periods of two and four weeks to determine the relative rate of release of nitrates under uniform conditions of temperature, moisture and aeration. Results are shown in Table 2.

Table 2.-- Average nitrification rates of soil from stubble mulch wheat-on-fallow plots

Tillage	p.p.m. NO_3 - N Released	
	Two weeks incubation	Four weeks incubation
Subtilled	8.1	13.2
Delayed subtilled	6.6	10.8
Onewayed	7.0	10.3

"Although statistical analyses of the data have not been completed, it would appear that there are no important differences in nitrification rate of surface soil from the onewayed and subtilled plots under the same conditions of temperature, moisture and aeration. Depressed nitrification observed in the field does not appear to be due to an accumulation of readily nitrifiable plant residues."

Determinations of Raw Organic Matter Content - O. E. Hays, LaCrosse, Wisconsin.-"Robert E. Taylor reports the results of a study conducted in 1950 to determine raw organic matter content of soil by 1.5" increments to 9 inches under varying types of seedbed preparation.

"Procedure: Samples were taken from each treatment immediately after grain planting, using a core sampler. These samples were 3" in diameter and 3" in length. All samples were sawed in half, dried in the electric oven and weighed, after which they were wrapped in cheese cloth of known weight. They were then soaked and washed until the soil was separated from the raw organic matter. The soil passed through the cheesecloth, leaving the organic matter. The cheese cloth and organic matter were then dried and weighed, and the weight of the organic matter determined by subtracting the known weight of the cheese cloth.

"Results: There is a definite difference in the location of the organic matter in the soil between fall plowing and subsurface tillage. The organic matter is concentrated in the upper 3 inches of the soil profile when the large field cultivator is used in subsurface tillage whereas it is concentrated in the 3 to 6-inch level of the profile when the land is tilled by plowing.

"The only difference between fall and spring subsurface tillage with the large field cultivator appears in the top 1-1/2 inches of the profile. Here the organic matter is about 3 times as much under spring subsurface tillage as under fall subsurface tillage.

"This soil was quite dry (less than 10% H_2O at 0-6" level) in the fall of 1949. The study will be continued for several years in order to obtain data under varying weather and soil conditions.

Organic Matter Plots

Sample Depth	Plowed Under *	Subsurface Tilled*
	Percent Organic Matter**	
0-1-1/2	1.55	1.89
1-1/2-3	1.62	1.78
3-4-1/2	1.51	1.55
4-1/2-6	1.94	1.24
6-7-1/2	2.62	0.97
7-1/2-9	1.43	0.88

* Green manure is alfalfa-brome, only first crop of hay made.
** Average of 6 samples.

Grassland Plots

Sample Depth	Plowed*	Subsurface Tillage**			
	Plot 7	Plot 5	Plot 16	Plot 17	Plot 23
	Percent Organic Matter				
0 - 1-1/2	2.10	2.65	3.12	2.56	2.71
1-1/2 - 3	2.09	1.85	1.78	1.95	1.85
3 - 4-1/2	2.51	1.85	1.29	1.29	1.32
4-1/2 - 6	1.35	1.48	1.10	0.90	0.85
6 - 7-1/2	1.14	0.99	1.24	0.92	0.97
7-1/2 - 9	1.06	1.09	0.91	0.81	0.73

* Plowed; grain following corn in CGHHHH
** Subsurface tilled; grain following hay in GHHHHH

Pasture Re-Renovation, Near Watershed A

Sample Depth	Subsurface Tillage	
	Fall	Spring
	Percent Organic Matter	
0 - 1-1/2	1.55	4.29
1-1/2 - 3	2.17	2.06
3 - 4-1/2	1.88	1.81
4-1/2 - 6	1.23	1.16
6 - 7-1/2	1.20	1.16
7-1/2 - 9	1.88	1.50

Pasture Plot Re-Renovation

Sample Depth	Subsurface Tilled	Fall Plowed	Spring Plowed
	Percent Organic Matter*		
0 - 1-1/2	2.05	0.69	1.54
1-1/2 - 3	1.48	0.82	1.24
3 - 4-1/2	0.39	1.67	1.66
4-1/2 - 6	0.32	0.68	1.08
6 - 7-1/2	0.49	0.78	0.87
7-1/2 - 9	0.21	0.24	0.64

* Average of 3 samples.

Bluegrass Sod, Subsurface Tilled

Sample Depth	Upper Section	Lower Section
	Percent Organic Matter	
0 - 1-1/2	1.65	0.93
1-1/2 - 3	1.50	1.97
3 - 4-1/2	1.32	1.76
4-1/2 - 6	1.26	0.90
6 - 7-1/2	1.06	0.93
7-1/2 - 9	0.90	0.78

Tropical Kudzu Pastures on Steep Land - R. M. Smith, Rio Piedras, Puerto Rico. (Cooperative BPI-SCS, Insular Experiment Station and Federal Experiment Station) - "Mr. Caro has summarized a full year of results of our pasture management study at Orocovis. The experimental animals have been removed and slaughtered and he is repairing fences, selecting and treating animals and completing other preparations for a second year of grazing. The gains of 1.5 pounds per head per day and of 477 pounds of beef per acre on these 50% slopes and shallow soils are impressive. The dressing percentage of all the animals averaged 52%, compared to an accepted average of 44% for cattle butchered off of the common native pastures. Several foreign visitors, as well as local people, have been enthusiastic about the results of this experiment and the appearance of the pastures.

"Latest results from the plots associated with the pastures at Orocovis are summarized by Mr. Cornuda in Table 1. The yields seem to favor high cutting in the A and B strips. Molojillo grass in strip C apparently overshadows other yield factors. Kudzu percentages, as noted in previous cuttings, are higher with high cutting. There is little suggestion of response to phosphorus or potash.

"It seems clear from results at Orocovis and elsewhere that yields of tropical kudzu are strongly influenced by harvesting procedure. Cutting at ground level quickly kills the kudzu plants and results in no yield. Maximum growth and yield are obtained by grazing, which is essentially a harvesting of the leaves and the young growing tips.

Table 1.--Yields per acre, kudzu content, dry matter values, treatments and heights of cutting of molasses grass grown with Tropical kudzu at Orocovis (Fertilizer test plots at Mr. Caro's farm).

Treatment	Plot* No.	Yield of Mixture** Palatable Forage: Measured Height (Inches) Ave.	Yield of Mixture** Palatable Forage: Dry Weight Per Acre (Pounds)	Field Estimate Kudzu content (Percent) Ave.	Tropical kudzu in yield Laboratory Separation Dry Basis	Cutting Height
ck	A1	33	2145	15	34	Hi
P	A2	33	2742	45	33	Hi
PK	A3	30	2390	40	46	Hi
ck	A4	18	1366	38	46	Lo
PK	A5	17	1046	33	58	Lo
P	A6	20	1547	10	20	Lo
ck	B1	19	1771	5	9	Lo
P	B2	21	2433	7(a)	23	Lo
PK	B3	31	2262	15(a)	54	Lo
P	B4	29	1590	30(a)	50	Hi
ck	B5	36	4599	37	64	Hi
PK	B6	39	4044	55	61	Hi
PK	B7	36	3660	30	36	Lo
P	B8	23	2401	20	23	Lo
ck	B9	29	2817	17	16	Lo
ck	B10	33	5164	38	49	Hi
PK	B11	31	3702	45	64	Hi
P	B12	37	3212	43	48	Hi
PK	C1	29	2294	48	58	Hi
P	C2	34	3436	45(b)	53	Hi
ck	C3	36	2401	40	58	Hi
P	C4	24	2785	40	59	Lo
ck	C5	40	3318	10(b)	13	Lo
PK	C6	40	2774	10(b)	16	Lo

(*) A, B, and C refer to upper, middle and lower strips, respectively.

(**) These yields are of green palatable forage which has come back after cutting at two different heights on November 24, 1950.

(a) Plots B2, B3, and B4 contained also 20, 5 and 7 percent guinea grass, respectively.

(b) Plots C2, C5, and C6 contained also 10, 70, and 60 percent malojillo grass, respectively.

The Oklahoma Agricultural Experiment Station Mimeographed Circular M-223.- Harley A. Daniel, Harry M. Elwell and Maurice B. Cox, Guthrie, Okla.-"The Oklahoma Agricultural Experiment Station Mimeographed Circular M-223 is a progress report on Soil and Water Conservation Research at the Wheatland Conservation Experiment Station, Cherokee, Oklahoma. Some of the items in this report are given below:

Method of Plowing Terraced Land

"Terraces in wheat fields of the plains present many problems. An important one is the plowing of terraced land. Much of the difficulty can be overcome with a two-way plow of the kind used on the Wheatland Station. It consists of right and left, directly connected plow bottoms. With this plow it is not necessary to lay out lands; the soil is all turned uphill or downhill. Due to the downward movement of soil by erosion, however, plowing at the Wheatland Station is done so as to throw the soil uphill.

"The uphill operations are started at the top of the slope and plowing is continued until the furrows enter a terrace channel. The remaining part of the interval is plowed in the same manner, starting and ending the furrows in the channels.

"The downhill tillage is started from the bottom of the slope. Plowing continues until the furrows reach the lower edge of a terrace ridge. Then the remainder of the interval is worked out with all furrows starting and ending along this line. The next furrow is on the terrace and cuts through the ends of all the furrows in the interval.

"In this way all tillage is conducted with the terrace and channels. No dead furrows or back furrows are left in the intervals. As a result the channels are opened, and at Cherokee the original soil level has been maintained between terraces. This method of plowing is now being tested on other types of soil at the A. & M. Farm at Oklahoma City.

Conservation of Runoff Water

"Water conservation value of different methods of seedbed preparation, contour cultivation and terraces has been studied during the past nine years (Table 1). During this period rainfall has been about average. However, there were two extremely wet seasons and also two abnormally dry ones (Table 2). A large amount of the water from high intensity rains was saved by both mulches and rough surfaces.

"Where all cultivation was conducted up and down the slope, runoff was least from the mulch land and most from the listed. Runoff on basin-listed plots was about the same as that on the plowed, probably because the dams in the furrows often broke during heavy rains. But both listing and basin-listing greatly reduced runoff water when listing followed the contour.

"Contour farming alone was not enough, however, for controlling soil and water losses on the steeper slopes. Where a combination of terraces and xontour cultivation was used the average annual amount of runoff from the four types of plowing was reduced 39 percent. This water was stored in the soil for plant use and did not contribute to the flood waters of local streams.

"July rainfall at this station is usually low, averaging only 1.97 inches. But, in 1950 it was 8.66 inches. There were 15 separate rains, the most critical of which fell on wet soil. It had 5-, 15- and 30-minute intensities of 7.20, 4.02 and 3.36 inches per hour, respectively. Sheet and gully erosion was severe on all plowed plots. The soil was completely deflocculated. The stubble mulch plots, however, showed little or no signs of erosion or deflocculation. In fact, most of them were fluffy and had perfect flocculated conditions.

"The first and second year after the terraces were built, the yield of wheat was lower on the terraced and the contour cultivated plots than it was on plots cultivated with the slope (Table 2). But, beginning with the third year (apparently after nature had time to adjust soil conditions in the disturbed portion of the ridges and channels) the yields have been slightly higher on the terraced plots except in 1949, an abnormally wet season.

Table 1.--Effect of Tillage Method, Contour Cultivation and Terraces on Percentage of Runoff Water from Deep, Permeable Soil, during a Nine-Year Period; Cherokee, Oklahoma.

Method of Tillage 1/	Effect of Kind of Cultivation on Runoff 2/			Proportion of Runoff Saved 3/	
	With Slope	Contour	Terrace & Contour	Contour	Terrace & Contour
Stubble Mulch	12.4	11.5	8.0	7	35
Plowed	14.0	12.2	9.0	13	36
Listed	15.4	10.7	9.2	31	40
Basin Listed	14.4	9.0	8.3	37	42
Average	14.0	10.8	8.6	23	39

1/ Terraces short and built level with one end open.
2/ Results of runoff in percentage of annual precipitation for crop year (July 1 to June 30) 1942 to 1950.
3/ Proportion expressed as a percentage of that from plots cultivated with the slope.

Table 2.--Effect of Contour Cultivation and Terraces on Wheat Yields at Cherokee, Oklahoma.

Years	Difference in Yield as Compared to Plots Cultivated with Slope[1] (Bushels per acre)		Total Annual Precipitation (Inches)
	Cultivated on Contour	Terraced and Cultivated on Contour[2]	
1942	-0.5	-1.9	30.0
1943	0.7	-0.5	20.3
1944	1.5	1.7	20.4
1945	1.4	1.3	34.3
1946	3.0	2.8	23.7
1947[3]	0.7	1.2	24.6
1948	0.6	2.0	17.9
1949	0.8	0.0	42.1
1950[4]	1.9	3.0	18.2
Average	1.1	1.1	25.7

1/ This data was obtained by subtracting the yield of the plots cultivated with slope, from those on contour and those terraced and contour cultivated. The average yield in bushels per acre for plots cultivated with slope was 16.5, contour 17.6 and terrace-contour, 17.6. The yields of wheat are averages of stubble mulch, plowed, listed and basin-listed areas.

2/ Short level terraces, one end open.

3/ The rainfall was below the average during the summer, fall and winter, but above the average during the spring growing season.

4/ There was good subsoil moisture at seeding time. Precipitation, however, was extremely low during the fall, winter and early spring months, but rainfall was slightly above average in May.

Vegetated Waterways

"Before terraces are built, provision must be made to dispose of the runoff water. Broad, naturally vegetated drainage ways are best for this purpose. When they are not available, channels must be made. Various kinds of plants for lining these channels are being tested on the Wheatland Station at Cherokee. Sod-forming grasses are the best plants for lining water channels, as shown by tests at Guthrie. Buffalo grass has made a good cover for channels on the Cherokee Station. Bunch grass and legumes do not provide as dense a soil cover as the sod grasses. But at Cherokee, where the soil is deep and fertile, weeping lovegrass, switch grass and mixtures of these and other grasses are giving adequate protection for outlet channels on land slopes of two to three percent. Alfalfa is providing a satisfactory protective cover and normal hay crop in channels on the flatter slopes at this station.

"These studies and field observations show that vegetation in water channels should be frequently mowed or systematically grazed for best results. This promotes good tillering and reduces excessive turbulence in flow of water, which aids in preventing silt deposits.

"The success of a vegetated waterway depends upon proper design of channel, condition of soil, selection and establishment of plants, and method of maintenance. Silt deposits have given most trouble. Methods of keeping the silt out of the channel or managing the channels in such a way that the silt will not interfere need study."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Rainfall for the month was well over normal - totaling 5.54 inches. Rainfall, runoff, and erosion data for the four runoff periods on the corn watersheds appear in the following tables:

Watershed No.	Treatment	Date	Rainfall Amount (inches)	Rainfall Max. 5-min. (in/hr.)	Runoff Amount (inches)	Runoff Peak (In/hr)	Erosion Lbs/acre	Remarks
113	Plow-contour	June 22	1.78	4.54	0.15	0.58	425	39% of area in slope of 10-20%
		June 24	.29	2.52	.01	.06	61	
		June 27	.58	1.71	.03	.13	172	
		June 29	.90	1.40	.16	.70	453	
118	Plow-St.row	June 22	1.78	4.54	.22	.88	32	5% of area in slope of 10-20%
		June 24	.29	2.52	.04	.30	86	
		June 27	.58	1.71	.10	.33	88	
		June 29	.90	1.40	.29	.99	457	
111	Mulch	No runoff or erosion						

"Mr. Dreibelbis reports that the subsoil (7-10-inch depth) in watershed No. 111 is now more permeable than that of No. 113. Both are in corn. No. 113 was plowed to a normal depth of 7 inches. No. 111 was plowed 3 to 4 inches deep and subsoiled 9 inches deep. Volume weights and percolation rates from 3-inch core samples taken at 7-10-inch depth for these two watersheds appear below:"

(Average of 6 samples)

Watershed No.	Volume weight	Percolation rates (inches per hour)
111	1.35	4.2
113	1.52	.97

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Texas.-"For the month of June, rainfall totaled 4.36 inches at Station 69 compared to the normal of 3.16 inches. The total for the 6-month period ending June 30 was 15.67 inches while the normal is 19.60 inches. The moisture deficiency is greater than these figures indicate due to the light rainfall the last 3 months of 1950. Only one storm in June caused appreciable runoff. The rain of June 16 totaled from 1.51 inches to 1.68 inches on the Government-owned land and there was at least a small amount of runoff from all areas except the 3-acre watershed of native grass. Rainfall and runoff amounts from this storm for selected areas are shown below:

	Areas with conservation practices							:Areas with ordinary pasture practices	
	Y	Y-2	Y-4	Y-6	Y-7	Y-8	Y-10	W-2	W-10
Area acres	309	132	79.9	20.9	40.0	20.8	21.0	130	19.7
Rainfall	1.607	1.641	1.661	1.641	1.631	1.640	1.677	1.664	1.670
Runoff	.020	.004	.001	.025	.152	.021	.145	.089	.283
Difference	1.587	1.637	1.660	1.616	1.479	1.619	1.532	1.575	1.387

"This type of runoff period does not give much indication of the benefits of conservation practices but the only appreciable runoff was from Area W-10, without conservation practices; Area Y-10, with conservation practices but with an area in cotton where the 1950 crop of clover was poor; and Area Y-7, where no clover has been grown. The larger areas that have appreciable acreages of pasture in the stream channels absorbed a considerable amount of the runoff from the smaller more intensely cultivated areas upstream. This is the greatest amount of runoff here since February 12, 1950.

"On June 19, soil samples from the Y and W areas gave the following percentages of moisture at the designated depth intervals from cotton, corn, and oat fields:

Y Area: 0-6 inches, 27.7 percent; 6-12 inches, 26.8 percent; 12-24 inches, 25.6 percent; 24-36 inches, 24.6 percent; 36-48 inches, 23.1 percent; and 48-60 inches; 24.1 percent.

W Area: 0-6 inches, 25.7 percent; 6-12 inches, 25.6 percent; 12-24 inches, 25.2 percent; 24-36 inches, 24.9 percent; 36-48 inches, 24.9 percent; and 48-60 inches, 25.1 percent.

"The Y area has applied conservation measures. The W area is with conventional farming methods.

"Profitable returns were obtained from added nitrogen to fall seeded oats in a cotton-, corn-, and oat-cropping system. Three different rates of 33 percent ammonium nitrate were used; 100 pounds, 200 pounds, and 300 pounds per acre. The increase in yield per acre from the different rates of application were as follows:

100 pounds per acre -- 16.4 bushels
200 pounds per acre -- 18.7 bushels
300 pounds per acre -- 21.1 bushels

"Figuring the ammonium nitrate at $80.00 per ton and the oats at $1.00 per bushel, the increased income per acre less the cost of fertilizer was $12.40 per acre for 100-pound application; $10.70 per acre for the 200-pound application; and $9.10 per acre for the 300-pound application.

"The same rates of application were applied to spring seeded oats following cotton with the following increases in yield per acre;

100 pounds per acre -- 3.5 bushels
200 pounds per acre -- 4.7 bushels
300 pounds per acre -- 10.5 bushels

"The increased yields per acre on spring planted oats following cotton did not pay for the cost of the added fertilizer this season."

Hydrologic Studies - N. L. Stoltenberg, LaFayette, Indiana.-"Rainfall at the Throckmorton Farm was 'normal' for this period; averaging 4.35 inches in May and 4.60 inches in June. Due to below normal rainfall in March and April, rains of 1.5 inches on May 10 and 1.3 inches on May 26 caused only traces of runoff. After considerable rain the previous week, a sharp thunderstorm of June 17 caused appreciable runoff which has been tabulated in table 1. Analysis of the samples has not been completed, but it was evident that this rain caused appreciable erosion on the prevailing practice watersheds while erosion was negligible on the conservation practice watersheds.

"The variability of the rate and amount of rainfall is of interest and indicates the necessity for a closely spaced rain-gage network for rains of this type.

"The greater total runoff from watershed 7 as compared to watershed 6 is interesting in view of the higher subsoil permeability of watershed 7, which consistently furnishes the least annual runoff. (9-year average annual runoff watershed 6 = 2.15 inches, and watershed 7 = 0.83 inch). Acting conversely to this higher permeability, watershed 7 has a steeper slope and consequently considerably less depression storage while under contour cultivation.

"Now rainfall rates enter the picture. For the rains falling at low rates the higher permeability of the subsoil of watershed 7 is dominant in controlling the relative runoff. During the intense summer thunderstorms, however, differences in permeability have less time in which to be effective and the depression storage takes on added importance resulting in a reversal in the runoff behavior between the two watersheds. (Examination of 10 major runoff periods during June, July, and August indicates more runoff, averaging 0.14 inch, from watershed 7 in every case but one). This is but one of the numerous interactions between rainfall characteristics and watersheds characteristics which results in anomalous runoff behavior when the relative importance of the factors affecting runoff are not well understood. Studies of such apparent anomalies are important for they can lead to the development of principles which can be extended to other areas.

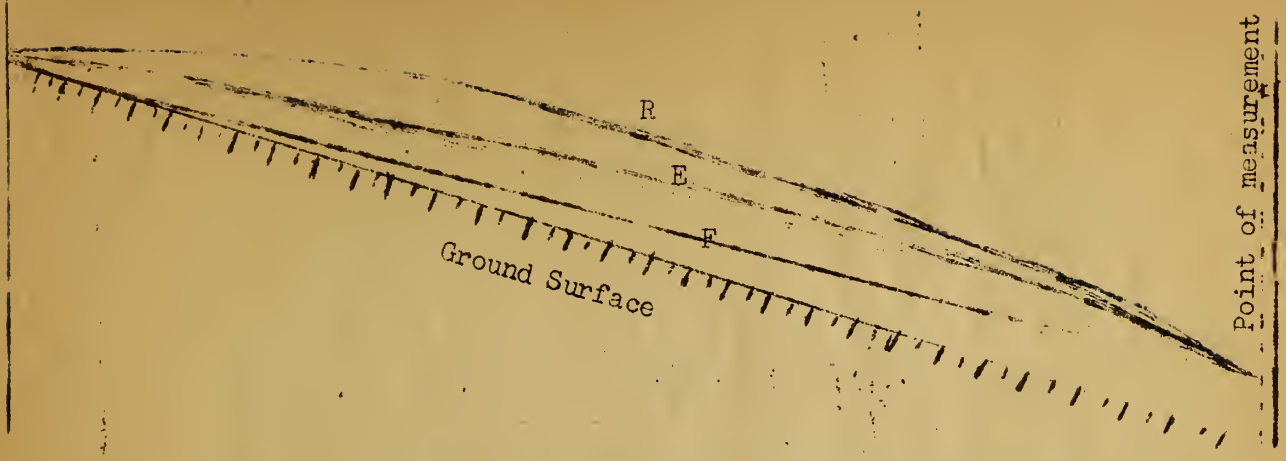
"In connection with surface detention--discharge relations, the same principles and factors operate to determine runoff throughout the world; it is only the relative effectiveness of these factors that varies from one location to another and during the course of a season at any location. A worthy objective of hydrologic research should be the extension of hydrologic principles found to apply at one location to other areas.

"One such principle, the logarithmic relation between the runoff rate from an area and the corresponding surface detention was proposed by Horton. However, for proper comparison or extrapolation from one area to another some of the limitations of the principle must be recognized. Izzard and Augustine (AGU Trans. v. 24 Part 2, p. 500, 1943) first pointed out some of the limitations when they derived equations for detention on the rising side and on the recession side of the hydrograph. He concluded, '...detention on the rising side of the hydrograph, or at any time that rain is falling, is definitely and appreciably greater than the detention required to maintain the same rate of flow on the recession side of the hydrograph after all rainfall has ceased." The difference in detention between the rising and falling stages has since been well substantiated by SCS, Research.

"The differences are readily understood from a consideration of the following schematic (exaggerated vertical scale) profile of surface detention along the path of flow:

Table 1.---Tunoff summary data for storm of June 17, 1951, Purdue-Throckmorton Farm, Lafayette, Ind.

Crop	Treatment	Wsd. No.	Rainfall		Runoff	
			Total Inches	In./hr. 15 min.	Total Inches	Peak rate In./hr., G.D.E.
Corn	Prevailing	4	1.13	2.84	0.52	2.76
		12	.92	2.72	.33	1.69
		Mean			0.42	2.20
	Conservation	2	1.13	2.84	0.07	0.29
		11	.92	2.72	.05	.21
		Mean			0.06	0.25
	Average treatment difference				.36	1.95
Soy Beans	Prevailing	5	1.13	2.84	0.43	1.84
		8	1.09	2.84	.41	1.82
		Mean			0.42	1.83
	Conservation	6	1.13	2.84	0.06	0.14
		7	1.09	2.84	.21	.93
		Mean			0.14	0.54
	Average treatment difference				0.28	1.29
Wheat	Prevailing	10	1.13	2.84	0.12	0.52
		15	.95	1.88	-	-
		Mean			0.06	
	Conservation	18	0.88	2.20	0.01	0.06
		14	.95	1.88	-	-
		Mean			0.005	
	Average treatment difference				0.05	



"The area under the curves R, E. and F represents the detention on a unit width strip at a point on the rising stage, constant stage, and falling stages, respectively.

"The shape of the watershed affects these detention-discharge relations markedly due to the variable area represented along the profile. Differences are larger on fan-shaped watersheds. A further factor influencing detention-discharge relations has been noted by Schiff (AGU Trans. v. 32 No. 1 p. 59, Feb., 1951), who found large differences in detention-discharge curves for successive peaks. Decreases in detention for successive peaks can be rationally explained on the basis of decreased resistance to flow by sheet erosion and the development of flow channels or rills, but a subsequent increase in detention for the same discharge is difficult to explain.

"We have noted these differences but our sectional method of hydrograph analysis tends to eliminate their influence. In conformity with the results of Izzard and Augustine, we have further noted detention differences due to the turbulence created by rainfall impact. Any intense burst of rain on land recently planted to corn or soy beans may cause as much as 15 percent increase in detention and a corresponding temporary decrease in runoff rate. In utilizing detention-discharge data from areas with little canopy protection, the rainfall rate should be considered. Most detention-discharge curves have been derived from recession curves obtained with no rain falling and the use of such data in analysis of a hydrograph can lead to a displacement of the infiltration curve during periods of high intensity rainfall or rising stages."

Hydrologic Studies - A. W. Cooper, Auburn, Alabama.-"The June rainfall of 7.48 inches represent 185 percent of the 70-year average of 4.05 inches for Auburn.

"Two rains of 3.64 inches and 0.73 inch caused runoff and soil loss from the erosion plots. A summary of the water and soil losses is given in table 1.

"On May 31 and June 1, Messrs. Sanders, Richardson, Aldrich, Conniff, and Cooper observed results of drainage projects, meadow outlets, and fescue Kentucky 31 seed production in the Northeast Alabama Soil Conservation District. On the G. W. Jones and sons farm, they were just starting to harvest the first of 1,300 acres of fescue Kentucky 31 seed. They were trying for the first time cutting the fescue with a 12-foot John Deere windrower. This machine cut the fescue approximately 10 inches from the ground and placed the seed heads all in one direction in a 30-inch windrow. When the seed were dried, they were picked up from the windrow

Table 1.--Soil and water losses from erosion plots, Auburn, Ala.

Plot	Slope	Vegetative cover	June 19, 1951 3.64 inches rainfall		June 20, 1951 0.73 inch rainfall	
			Water loss	Soil loss	Water loss	Soil loss
			Inches	Lb./acre	Inches	Lb./acre
1	2-1/2	Poor stand alfalfa	1.49	1,040	0.28	128
2	5	Cotton	1.50	447	.34	308
3	5	Mature crimson clover & rye grass	.29	76	.11	0
4	5	Corn	.48	128	.09	35
5	10	Poor stand fescue & ladino clover	1.51	2,360	.28	290
6	10	Corn	.87	2,490	.20	505
7	10	Cotton	1.71	15,350	.41	2,018
8	10	Cotton	1.81	18,820	.35	1,753
9	20	Corn	.46	3,870	0	0
10	20	Corn	.22	680	0	0

with a 7-foot combine. This operation was started 3 to 5 days before the crop was ready to combine direct. Mr. Kearley, District Conservationist, reported that after the harvesting was finished the Jones were well pleased with this method of harvesting fescue seed. It enabled them to harvest the same area with about one-half the number of combines. They also reported that the seed dried more uniformly and they got a better grade of seed. The fescue had been grazed until March 10 at the rate of 3 cows per acre. There was an excellent seed crop on all of the area observed.

"Two drainage projects were observed on the May 31-June 1 trip. The first was an individual farm on which 4,900 feet of main channel and 7,050 feet of lateral ditches had been dug in July 1947 at a cost of $4,500. The farmer said that the extra crops produced through 1950 paid the entire cost of the drainage work. The drainage benefited 150 acres. The second drainage project benefited 500 acres on six farms. Only one farm was visited. The farmer, who paid $2,590.35 as his part of the drainage work, said that the increased yields of his first two crops after the job was completed paid this cost plus the interest.

"Mr. Lockett reported mechanical analyses on one soil at two depths and one soil at three depths (table 2). Mr. Lockett completed his 120-day detail at Auburn and was transferred to Huntsville June 18."

Table 2.--Mechanical Analysis of Soils (Alabama)*

Particle Size	Particle Description	Cecil - Depth 2"-5"	Cecil - Depth 12"-15"
		Corrected average	
Mm		Percent	
2	Gravel	0.00	21.28
2-1	Fine gravel	.84	1.81
1-.5	Coarse sand	2.78	3.81
.5-.25	Medium sand	4.50	4.49
.25-.1	Fine sand	10.35	10.10
.1-.05	Very fine sand	9.31	7.27
.05-.005	Silt	33.77	22.46
.005	Clay	38.45	28.78
	Total	100.00	100.00

Particle Size	Particle Description	Faceville - Depth 0"-3"	Faceville - Depth 7"-10"	Faceville - Depth 20"-23"
		Corrected average		
Mm		Percent		
2	Gravel	0.00	0.00	1.25
2-1	Fine gravel	.78	.62	1.34
1-.5	Coarse sand	5.48	4.42	5.40
.5-.25	Medium sand	14.01	12.01	11.23
.25-.1	Fine sand	26.02	24.27	20.51
.1-.05	Very fine sand	24.58	21.07	16.24
.05-.005	Silt	22.06	23.92	20.20
.005	Clay	7.07	13.69	23.83
	Total	100.00	100.00	100.00

Textural classification as determined by mechanical analysis:
Cecil: Clay loam - 2"-5"; sandy clay loam - 12"-15".
Faceville: Sandy loam - 0"-3" and 7"-10"; sandy clay loam - 20"-23".
*Data obtained jointly by SCS Research and Operations.

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.-"The design report covering the box inlet drop spillway was reproduced, and printed copies were returned to the Laboratory on June 19. This report is being published as Technical Paper No. 8, Series B. of the St. Anthony Falls Hydraulic Laboratory and is entitled 'Hydraulic Design of the Box Inlet Drop Spillway.' This report together with Technical Paper No. 7 (the research report on the box inlet drop spillway) were distributed to the regional engineers and to other SCS key personnel.

"Computations on the square drop inlet were completed during June. Complete tests of the 42-inch circular riser with splitter baffle--both round and sharp edged weir--were made. Complete tests of the 42-inch circular riser without baffle--round edged weir--were made. Without baffle, a large vortex is formed which makes it difficult to determine flow conditions after leaving the range of weir control. Full pipe flow is not obtained until high heads are reached. The splitter baffle apparently destroys the vortex allowing full pipe flow at much lower heads.

"On June 4 and 5, Messrs. Blaisdell and Donnelly were in Western Iowa inspecting hydraulic structures and conferring with the GS-9 and GS-7 engineers there. Of the structures observed which had been constructed within the last 8 years, only one was operating in a manner to cause concern. This was a straight drop spillway having an outlet of the type which had been found unsuccessful at Whiting Field, Fla., and which model tests at the Laboratory had indicated poor performance. The results of the preliminary tests made on the straight drop spillway study which Mr. Donnelly is conducting were discussed with Mr. Moratz of the Region III - Engineering Division and with Mr. Culp of the Engineering Standards Unit. It was explained to them that probably both longitudinal sills and floor blocks would be required in the stilling pool." Mr. Blaisdell spent June 6 and 7 in Missouri inspecting structures there and conferring with the Operations engineers located in that state regarding some pipe drop inlets being constructed with circular risers. Over 30 of these structures were built by one work group engineer last year. Through the use of standard reusable steel forms, the spillway on one recent structure was constructed with the use of only 5 man-days of labor. Model tests are being conducted on these spillways at the request of Mr. Freyburger, Regional Engineer of Region III. Mr. Blaisdell was particularly interested in the fact that the Missouri engineers understood the problems involved in the proposed research on these spillways, could discuss the study intelligently, and could offer constructive comments. The training which they had received at the Hydraulic Laboratory in previous years was readily apparent."

Drainage Studies - J. C. Stephens, West Palm Beach, Florida.-"Mr. Speir was on leave during the past month and there was very little work in the field with the exception of a reconnaissance survey which was made to determine suitable sites for the testing of various types of herbicides for the control of para grass. A stretch was selected along the south bank of Cypress Creek Canal west of Pompano and immediately west of State Road 7, which is along the District right-of-way. Arrangements were made through the Flood Control District for a commercial spraying company to apply the herbicides. It is planned to run a series of tests on different types of herbicides in cooperation with the Central and Southern Florida Flood Control District and the Experiment Station for the control of para grass along ditch and canal banks. We plan to test a number of formulations by spraying each different material on to a 100' x 25' test plot along the canal bank leaving 50-foot balks in between each treated plot. Each different type of treatment will be randomized and replicated in triplicate. After the course of treatment has been completed, it is planned to plant a few test sprigs of pangola or other desirable species of grass along the bare canal bank to determine the after-effects or residual toxicity of

each treatment. If the desired materials for formulation arrive in time, it is planned to begin spraying treatments by July 16.

"It has been decided to prepare a cooperative 'Progress Report on Subsidence of Organic Soils in Florida' and considerable work has been accomplished in accumulating data and other information to be incorporated into the Report. Graphs have been prepared showing the results of surveys on 16 subsidence lines, some of which were started as early as 1916, and the rates of subsidence for the organic soils on the controlled water-table plots at the Everglades Experiment Station for the entire period, beginning in November 1936 until termination in April 1943, were compiled. Earlier progress reports were generally confirmed. The type of culture was of relatively small influence in determining the rate of subsidence which depended primarily upon the depth of the water level below ground surface. The average rate of soil loss in inches per year as compared with various water-table depths below ground surface is tabulated:

Average depth of water table below ground surface (Inches)	Average rate of subsidence of ground surface per year (Inches)
12	5/8
18	1-1/16
24	1-7/16
30	1-13/16
36	2-1/4

"It will be noticed that the average subsidence rates may be slightly more than thos found for other regions; however, due to the sub-tropical climate, the warmer soil temperature and the absence of soil freezing during the year, it is logical to assume that the bacterial action of the aerobic bacteria causing oxidation would be increased over that occurring in the cooler temperate zones.

"Data have been secured and graphs prepared showing the subsidence of the agricultural area of organic soils of the Northern Everglades south of Lake Okeechobee and north of the Palm Beach-Broward County Line. Maps showing the depth of peat soils for 1912, 1925, 1940, and 1950 have been prepared from early canal surveys, early Everglades Drainage District surveys, more recent surveys by this project in 1940 and the Army Engineers in 1950. When all the information has been analyzed, it is planned to prepare maps showing expected or predicted soil subsidence for future years, up until the year 2000, in order that contemplated future water controlled plans in the Everglades will have this information for use in developing such a program."

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"In the area in which the Sunland Grove Plots are located total rainfall for the month was 4.35 inches recorded during the periods June 5 - 7 and June 14 through June 20. With little or no rain falling from May 21 to June 5 we had a rapid increase in the readings on the unirrigated area. Weeds reached the wilting point about June 1 and trees wilted on June 3. On the cycle plots, water was applied on a 6-day interval to maintain the moisture level above 15 - 18 percent. At this level it has been found weeds and grasses in the area begin wilting. Even in those plots which received 1 inch per week in one application and those receiving two 1/2-inch applications per week, wilting of weeds usually occurred before the end of the period of application.

"The direct reading as well as the old style moisture meter have been used since the initiation of these plots. The new direct reading meter seems to be giving consistent accurate results. The work this year has again corroborated past work where it was found that as the winter progresses the cycle must be shortened to maintain sufficient moisture for good growth.

"Chloride samples collected from the lines in the Miami area June 8 showed that the concentration on the whole remained about the same as for the previous sampling in April. Where some of the samples showed an increase there was not enough to cause damage to plants.

"From our data indications are that part of this increase could be minimized further if better control of the chloride barriers was maintained.

"Chloride samples collected from lines in the Homestead area show that there has been an increase in the concentration in the Goulds Canal area from the Bay to a point 1/2 mile west of the structure. There has been an increase for all of the area on the Military Canal though the concentration east of Allapattah Road to the Bay was greater than that area west of the road.

"On the North Canal line there has been an increase inland to a point 3.5 miles west of the structure and there has been a build-up in concentration at the 6.5-mile sampling point.

"The increase in the Goulds and Military Canals can be attributed to poor regulation of the structures and residual materials. Rainfall has been relatively light for the past year, and we have had no heavy rains to leach out the chlorides.

"The increase on the North Canal is due to heavy pumping from the deep rock ditches. The increase at the west end of this canal is due probably to dumping of sewage by the City of Homestead which has a disposal system at the end of this canal."

Drainage Studies - E. G. Diseker, Raleigh, North Carolina.-"Following several heavy rains, the water table was found to be 1 foot or more beneath the soil surface within 24 hours after rain on the subsoiled area. Previous drainage on this area has been very unsatisfactory. Subsoiling was performed in April over the old 4-foot depth tiled area which now has tile at depths of 3 feet. The depth of operation ranged from 16 to 22 inches at 5-foot intervals over the tile lines and also 4 troughs were made on each side of the tile lines at 3- to 4-foot intervals. See April report for further details. It remains to be seen how long the effect of the subsoiling will last."

Supplemental Irrigation Studies - J. R. Carreker, Athens, Georgia.-"The rainfall of 5.32 inches, as reported by William B. Land, was fairly well distributed throughout the month. A deficiency of soil moisture developed during the last week, so irrigations were begun. These were interrupted by rains, however. The daily amounts of rainfall and irrigations were:

Date June	Rainfall	Irrigation Inches	Irrigation Crop
3	0.43		
4	.02		
7	1.08		
8 & 9	.15		
12 & 13	.63		
16	.73		
17	.54		
20	.09		
25	.22		
27		1.5	Vegetables
		1.5	Fescue pasture
28		1.5	Corn
		1.5	Watermelons
28	1.09		
29		1.0	Cotton
30	.34		
	Total 5.32		

"The rainfall measurements and vegetable irrigations were on the University Farm. The other crops irrigated were on the Watkinsville Station. The rainfall was less there than at the irrigation plots."

Supplemental Irrigation - T. W. Edminster, Blacksburg, Virginia.-"The rainfall for the month at the irrigation control plots was approximately 4.31 inches.

"The first application of 1.5 inches of water was completed on the two lots which receive irrigation and four lateral positions made on the second application before sample rainfall secured the system around the 10th of the month.

"The four pasture lots have been partially clipped. To date all lots are carrying the eight steers with no apparent shortage of herbage.

"On the control plots the clover has been sampled. The tobacco plots have been set and are growing nicely."

Sedimentation Studies - R. Woodburn, State College, Mississippi.-"A rather important rain fell at State College, Miss., on Saturday, June 16. It was desired to try out the new DH-48 sediment sampler so Mr. Burford and I went to Carroll County on Saturday afternoon. Thompson Creek had already crested and started down; however, there was about 3 feet of water at deepest places at bridge cross section.

"The sampler had been fitted with an adapter so that it could be attached to the end of our 1-inch conduit type sediment sounding rod. It required 20 feet of rod to reach to water. The velocity was about 6 feet per second and the sampler suspended at the mid-depth point filled in 10 seconds approximately. It worked well except the sampler could only be placed in water in a streamlined position and filling started at once. Any attempt to place sampler sidewise to lower to a sampling point in profile almost resulted in breaking the rod as it deflected about 4 feet out of line.

"The samples taken have not yet been analyzed in laboratory but appreciable quantities of bed material were present in each sample taken at mid-depth point of 1-1/2 feet.

"There is evidence that the concentration may be as much as 1/2 to 1 pound per cubic foot of flow. This work will be continued along with attempts to secure data on high water slope of Thompson Creek.

"The Goose Creek area about 3 miles west of Oxford has been of particular interest to the sedimentation people of our Service since about 1935. Attention is directed to the east fork of Goose Creek which has 500 acres or more of very critical gullied area in its headwaters. The bottom lands of this creek were in serious trouble from sediment drainage and lack of drainage before 1920. About this time a drainage district constructed a new channel for drainage and this channel rapidly filled with sand. It was reported to be about full for some distance in 1936.

"When first seen by the writer in 1949, the channel was filled 2 or 3 feet above level of bottom land and the bottom was about abandoned for crops, especially the area north of old Batesville road.

"In the summer of 1949, I was surprised to see the owner preparing for a crop in this field. It is encouraging to note that he had a fair crop in 1949, again in 1950, and good prospects for 1951. Of course, during each heavy rain water was all over the bottom. It should be remembered, however, that each major overflow left some silt in the shallow water deposition areas to mix with sand and the result is a gradual increase of silt content on the so-called pure sand areas. Organic matter from volunteer vegetation further helps the situation and thus in time we may have a reclamation of these sand beds.

"To my surprise again I discovered this month on a field trip that the landowner is again 'sticking his neck out' on what appears a rather hazardous project. From the standpoint of Soil Conservation Research, this may be a most fortunate happening. The owner, Mr. Anderson, has placed a drag line in the bottom and has excavated a new channel through the sand from a point about 1/4 mile south of old Batesville road to a point about 3/4 mile north of this old county road.

"Perceiving that this may be almost a made-to-measure proposition for us without cost, I have considered that Mr. Anderson has presented us with a field scale laboratory for sediment study. Mr. Burford and I ran precise levels over the entire limits of this project and established ranges marked by pipes at each end as follows:

0 + 00 is S. side of old Batesville Road Bridge going upstream or south.
0 + 50 Range
3 + 50 Range
6 + 50 Range
9 + 50 Range
12 + 50 Range near end of dredging
13 + 50 Range undistrubed old sanded full channel - Going north or downstream from bridge at 0 + 00
1 + 00 Range
4 + 00 Range
7 + 00 Range
10 + 00 Range
13 + 00 Range
18 + 50 Range

26 + 50 Range near Anderson-Avent line
28 + 50 Range little dredging
30 + 50 Range less dredging
32 + 70 Range no dredging
35 + 25 Range sand flat at start of sanding area
39 + 24 Range out on wide sanding area
42 + 25 Range out on wide sanding area - near end of sand deposition area

"Landowner, Mr. Avent, has perfected the picture for us to the extent of constructing a dyke square across the valley about 200 feet below 42 + 25 to force virtually all remaining sand to drop out.

"I believe that this set-up will give us a chance to do several things. Certainly we can measure reasonably well by future cross sections all sand reaching this portion of the channel. We can also study the behavior of a channel constructed in unstable material. I am afraid that we have overlooked one bet in that some of the sand produced by gullies in headwaters may be dropped in sand flats before reaching the study section. Therefore, I believe it wise to continue cross sections when field time permits backward from 13 + 50 south to new Highway 6 and perhaps south of Highway to where present valley plug ends."

Hydrologic Studies - J. A. Allis, Hastings, Nebraska.-"Rain was recorded on 18 days during June at the Meteorological Station and totaled 10.22 inches for the month. On June 1 and 2, 4.42 inches of rain fell in about 9 hours and the maximum intensities at the Meteorological Station was about 1.60 inches per hour which fell in about three storm periods. On June 26, 1.91 inches of rain was recorded. All the other rains were less than an inch and were well distributed over the month.

"June rainfall was about 6.27 inches above the 3.95 inches average rainfall at Hastings for the past 55 years. In May 1903, Hastings received 10.92 inches of rain; in June 1915, 11.71 inches and in July 1902, 10.62 inches, which are the only months since 1895 receiving more rain. The maximum daily rainfall in Hastings exceeded 4 inches only twice during the period of record. On May 14, 1905, they had 4.50 inches and on August 6, 1898, they received 4.60 inches.

"The rain of June 1 and 2, varied from 3.83 inches in the upper part of the watershed to 5.25 inches in the lower part of the watershed, a distance of about 5 miles. This storm produced a new maximum peak of discharge on the 411, 481, 2,086, and 3,490-acre watersheds for the past 12 years of record. Watershed W-5, which is about 65 percent under conservation practices, received a weighted rainfall of about 4.80 inches and the maximum discharge was about 1.0 inches per hour. There were no breaks observed in the terraces and no appreciable erosion on the land farmed on the contour. Watershed W-3, which is untreated, received a weighted rainfall of 4.05 inches, which was 0.75 inch less than W-5, yet the maximum peak rates of discharge were about 1.3 inches per hour. Computations have not been made on the total runoff from the two areas which should show some interesting results based on two storms last year which showed that the rainfall minus runoff was about 3/4 inch greater on W-5 than on W-3.

"The following average maximum peak rates of runoff from the approximately 4-acre watersheds were observed during June 1951:

Table 1.--Average maximum peak rates of runoff from approximately 4-acre watersheds under various land use practices

June 1951 Date	Straight row	Contoured	Subtilled
	In./hr.	In./hr.	In./hr.
CORN WATERSHEDS			
1-2	3.02	1.88	2.06
13-14	1.74	1.18	1.16
25-26	2.74	2.02	2.15
OAT WATERSHEDS			
1-2	2.70	2.02	2.63
13-14	1.54	1.20	1.05
25-26	2.96	1.66	2.30
WHEAT WATERSHEDS			
1-2	2.72	1.60	2.52
13-14	1.80	1.34	1.26
25-26	2.81	1.56	2.40

IRRIGATION AND WATER CONSERVATION DIVISION

Replenishment of Ground-Water Study - D. C. Muckel and W. T. Gish, Moorpark, California.-"Two -6-day runs have been made with the 0.001-acre infiltrometer. Rates obtained during the first run averaged 15 acre-feet per day per acre." Rates obtained during the second run at the same location averaged 6 feet per day. Water was off between runs for about 3 weeks. Soil samples taken on two sides of the infiltrometer showed increased moisture at 6-foot depths and 12 feet out. It is planned to install the infiltrometer at several locations throughout the valley. A search of possible locations in Happy Camp Canyon has been made for suitable soil types and available water supply." "A well has been chosen for use as an observation well in determining ground-water fluctuation. A water-stage recorder will be installed for this purpose."

Tehachapi Valley Investigations - W. W. Donnan and G. M. Litz, Los Angeles California.-"In connection with the cooperative water-supply study in the Tehachapi Soil Conservation District, in cooperation with the State Division of Water Resources, the 1951 acreage of each land-use classification has been determined for the valley floor areas of the District from the survey made by the SCS Tehachapi Work Unit personnel. When the acreage of the 1951 survey was compared with the 1950 survey, several marked changes were noted. In 1950 there were 1,500 acres of safflower grown, but none was grown in 1951. Two thousand and two hundred acres of land on which dry farm grain was grown in 1950 was abandoned to weeds in 1951, and a major portion of the land reported as cropped to dry farm grain in 1951 was irrigated in 1950. This reflects an effort to conserve the underground-water supply during the fifth consecutive year of below-normal precipitation. The acreage of land planted to alfalfa and various grasses for seed increased 2.4 times (1,150 acres) the 1950 acreage."

Moisture Characteristics - Irrigated Soils - V. S. Aronovici, Pomona, California.-"Because of the need for a measuring device for establishing the soil moisture and relations existing beneath and adjacent to an irrigation furrow during the period of water application, studies are being made of the relative merits of the Coshocton and Colman type soil moisture cells. The study is limited to the wetter range of soil moisture. Both Colman and Coshocton cells have been placed in 3-inch cylinders containing prepared soil samples. They are saturated and subsequently subjected to gradually increasing tensions. The samples are weighed and the cell condutivity recorded. Tensions have been observed between saturation and one-third atmospheres. Two soil types have been observed to date. They are Chino silty clay loam and Morina fine sand. Each type of cell was replicated six times. It was possible to observe the variations found between cells and two distinctly different soils. Tabulated below is a very brief summary of the results to illustrate the magnitude of variations observed. The cell data recorded here represents the extremes for each group of cells. It is evident that both types of cells are rather inconsistent from the standpoint of percent water and tension.

"If this variance is observed in additional soil types, it is doubtful if they can be used as an index of tension gradients or soil-moisture percentages on a quantitative basis in the degree of accuracy desired in the present irrigation study."

Soil type	Tension	Percent water		Coshocton cells cell readings		Colman cells cell readings	
				No. 5	No. 26	No. 11	No. 13
				Micro-ampheres	Micro-ampheres	Micro-ampheres	Micro-ampheres
Chino silty clay loam	0	41.0		113	97	189	173
	20	37.5		110	97	-	158
	40	31.0		110	94	-	154
	60	30.0		103	82	177	166
	100	29.0		100	81	176	164
	200	26.5		99	77	174	162
	270	23.3		104	76	174	159
	330	22.5		104	74	174	154
Marina fine sand	0	28.3 1/	26.0	-	-	-	-
	20	25.4	22.6	115	88	181	186
	40	19.8	16.2	108	76	173	178
	60	15.0	11.3	106	75	175	180
	330	8.0	4.2	95	72	169	175
	400	7.0	3.5	92	70	168	168

1/The Coshocton cell retained considerable moisture, more than the sand thus influencing the percent water computation. The Colman cell retains little or none measurable quantity of water. This is the reason for the difference in percent moisture of the sands.

"If this variance is observed in additional soil types, it is doubtful if they can be used as an index of tension gradients or soil-moisture percentages on a quantitative basis in the degree of accuracy desired in the present irrigation study."

Evapo-transpiration by Phreatophytes - H. F. Blaney, Los Angeles, California.-"As a member of subcommittee of the Pacific Southwest Federal Inter-Agency Technical Committee, revised a report on 'Determining Evapo-transpiration by Phreatophytes.' Salt cedar and some other phreatophytes use considerable water which otherwise would be available for irrigation. Tules and salt cedar growing in irrigation canals and drainage ditches are exposed in narrow strips to the sun and wind. Under such conditions, salt cedars along a mile of canal will usually consume enough water to irrigate 5 acres or more of agricultural crops. In the formula, U = KF, where U = consumptive use (evapo-transpiration), K = empirical coefficient and F = consumptive use factor (based on monthly temperatures and percent of daytime hours), the following seasonal coefficients (K) were suggested for computing evapo-transpiration for phreatophytes.

Classification		Seasonal K 1/
Saltgrass - Sacaton -	High water table	0.80
Alfalfa	Irrigated	.85
Seeped areas	High water table	.90
Rice	Irrigated	1.00
Small willows - saltcedars	Water table	1.00
Saltcedar - willows	High water table	1.20
Large cottonwoods - salt cedars - willows	High water table	1.30

1/ Consumptive use coefficient growing season, April - October.

Irrigation and Drainage Research in Utah - V. E. Hansen, Logan, Utah.- "Considerable interest has developed lately regarding the feasibility of the Briscoe ditchers and slopers. In order to be able to evaluate these products more fully and to see them in operation, a trip was made to California in the company of Mr. Briscoe. The ditcher was being used very successfully on the Friant-Kern Canal to make surface drainage ditches adjacent to the canal. The contractor who has rented the equipment from Mr. Briscoe is doing very well. Both of these pieces of equipment will aid materially in improving the construction and maintenance of open drains."

Irrigation Studies - C. E. Houston, Reno, Nevada.-"Preliminary data from the Stillwater gypsum irrigation trials is very encouraging. After six irrigations this year on three borders of 1.6 acres each, we have made the following measurements:

Treatment	Total water into soil (inches)
Gypsum in solution (total application 1.3 tons/ac	12.17
Control (No gypsum)	9.13
Gypsum on surface (6.11 tons/ac	20.60

"The above is quite noticeable in the growth on the border strips. The gypsum in solution and no gypsum borders have taken insufficient water to maintain a weed growth. The gypsum on surface border contains oats four feet high. The crop will be harvested this week and yields determined.

Irrigation Studies - F. W. Hamilton, Lincoln, Nebraska.-"The month of June has been much more suitable for hydrologic research than for irrigation studies.

"Some observations on a unique project designed to reduce the losses from a large canal by means of 'Silt Injection' may be of interest to some SCS Research men. The term 'Silt Injection' is used to designate the process of pumping a mixture of silt and water into the banks and bottom of the canal. The soil material is added to the existing soil, producing a higher density and a lower coefficient of permeability.

"The canal being treated is operated continuously for irrigation and power production. It is constructed in a deep loess soil. At points where seepage is known or suspected, holes are drilled along the bank on 50-foot centers with a rotary well rig. The normal depth is 60 feet, but is varied with the height of the bank. Twenty feet of 2-inch pipe are placed in the holes. Burlap sacks and gravel are used for packing to prevent leakage.

"A mixture of carefully selected soil with an equal amount of water forms the mud. The soil used is required to meet rigid specifications on mechanical analysis. The mixture is pumped into several wells at one time and men constantly watch the flow and pressure. When a well fills, pressure is built up to about 150 p. s. i.

"Several miles of ditch are being treated. Only a few observation wells will be available to check the effects of the treatment on local ground water. However, the District maintains a good set of water-measurement records which should yield some data on the effectiveness of the procedure."

Irrigation Studies - K. Harris and H. B. Peterson, Phoenix, Arizona.-"The cotton irrigation experiment on limited water supply was continued at the University of Arizona Farm near Mesa. In one phase of the experiment, soil temperatures are being recorded by thermograph on two different irrigation treatments. Both of these treatments received a pre-irrigation on the same date and were planted on the same date. However, Treatment 1 was to be irrigated on June 1, July 1, and August 1, and Treatment 2 was not to be irrigated until July 1, and then on August 1 and September 1.

"The purpose of this particular part of the experiment was to show the beneficial effect of an early irrigation on cotton. For best growing conditions, it is necessary that the soil temperature be kept below 90° and therefore, although the plants are not in need of water on June 1, they are in need of the cooling effect brought about by this early irrigation. An irrigation was given Treatment 1 on May 31, and as a result the soil temperature on Treatment 1 dropped about 12 or 13 degrees. In normal years, soil temperatures are considerably above 90 degrees, or nearer 100 degrees, and the effect of this 13-degree drop in temperature is very beneficial to plant growth. However, this year our temperatures have been below normal and most of the time somewhat below 90 degrees. Therefore, the beneficial effect of an early irrigation this year was not realized. This is one of the very few years when soil temperatures have been so low that an irrigation by June 1 has not been a stimulant to plant growth. The effect of this June 1 irrigation on reducing soil temperatures continued for about 2 weeks, after which the two treatments again approached the same temperature.

"Data were kept on the height of 20 cotton plants in each of these treatments, and it was found that the plants receiving the early irrigation were about 2 inches higher than those plants not receiving an early irrigation. In normal years, this variance would be much greater. Since this experiment is to continue for 3 years, it is very probable that this fact will be borne out.

"In another phase of this experiment, consumptive use figures are to be determined by soil-moisture samples."

"Quite an extensive irrigation test was conducted this spring on the University of Arizona Experiment Farm at Safford. The experimental field was divided into borders, some receiving rough tillage and some smooth tillage; some receiving an application of gypsum and some no gypsum, and some being irrigated by river water and others by well water of 4,017 P. P. M. The plots were planted to barley, and have now been harvested. However, the yield data have not been received, but from field inspections made, the yields of the various plots look to be about in the same proportion as the percolation rates in inches per hour of the various treatments, i. e., the barley in the rough tillage plots was about a foot higher than that in the smooth tillage plots. Soil amendments appeared to have no beneficial effect on the crop, and the barley irrigated by river water was about 1 foot higher than that irrigated by well water."

Irrigation Studies - S. J. Mech, Prosser, Washington.-"Though both this monthly total and the number of rainy days have been exceeded a number of times during the past 30 years, the fact that 'Rain Makers' were operating during this rainfall period touched off the battle between the rain makers and the anti-rain makers.

"The Dry-land wheat growers are sponsoring cloud seeding and were quite happy to have the rain. The irrigation farmers on the other hand, suffered from damage to hay and cherries and have organized under the name 'Sunshine Unlimited, Inc.' to protect their interests. They suggest that they may sponsor over-seeding of clouds and thus prevent rain.

Consumptive Use - S. J. Mech, Prosser, Washington.-"That wheat has a relatively high consumptive use was abruptly called to our attention when our dry plots used 2.95 inches during the 17-day period May 15 - June 1. This was particularly striking since it followed a period of low use when only 2.49 inches (including a 0.34 inch and a 0.57 inch rain) was used between March 28 (when the wheat came up), and May 15.

"The average consumptive use during May 15 - June 1 was 0.17 inch per day. This use occurred at a time when soil moisture was not very high. The soil moisture at the beginning of the period was 11.3 percent in the top 4 feet, and on June 1 it was 7.0. The available soil moisture thus ranged from 38 percent to 7.1 percent. By June 1 the moisture was completely depleted in the top 30 inches. The wheat started to joint about the middle of May and was in the 'boot' by June 1.

"It is significant that this 0.17 inch per day use took place under moisture conditions definitely inadequate for the full growth of the crop. The fact that its height was only 2.5 feet, whereas the other plots measured 3.5 feet is attributed to a lack of moisture at this critical time. Irrigating after the head is in the boot was too late to equalize the height with the other plots.

"The fact that this 0.17 inch per day use took place under such adverse conditions lends support to the greater consumptive use found for the wet and medium plots."

9/11/51